城西大学女子短大生を支援する情報リテラシー（Ⅰ）

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情報科学の急激な発展は私達の想像を超えたものがある。言葉をかえていえば，私達の認識を超えた領域で使用されていることに驚嘆する。この最先端の情報科学は，とりわけ情報処理技術者に対する教育に大きな影響を与える。そこで，これら情報科学教育を支援する教育支援システムをパソコン上で実現するようシミュレーションしたコンピュータのソフトウェアシミュレータを研究したものである。城西大学女子短大生がこのシステムを利用すればパソコン実習室にて，インタフェース，コンピュータ言語を含めたコンピュータシステムの学習が体得できる。

Information Literacy Which Supports Students in Josai Junior College for Women（Ⅰ）

1．Computer Interface Study System Which Supports Information Technology

Drastic development of the microelectronique is beyond our imagination. In other words, we are surprised that it is being used in the area which is beyond our recognition. In the microelectronic field, demand for microcomputer engineer can not be met in the present situation. The development of the educational system to train microcomputer engineer has already completed. Software simulation of the microcomputer, simulated to realize this educational system on personal computer, has been tried. Using this system, the study of the microcomputer system including interface and assembler can be done in the personal computer exercise room.

Since COMET･CASL is a virtual machine, it is difficult for beginners to learn and master CASL, the assembly language to control machine I/O. Despite such difficulty, assembly language is still essential for I/O control and needs to be studied. To facilitate this difficult task, we have developed an intelligent simulation along with CAI for a CASL courseware. Its outline of organization, usage, and characteristics are explained as following.

1．Present assembly language learning method

1.1　Theoretical trace

1.2 COMET・CASL softwares

Unfortunately, these softwares are not good enough for beginners to learn CASL editor function and I/O control.

1.3 CAI coursewares, manuals, documentation, others

2. Policy of the intelligent simulator

By improving the present trainning facilities, we haye developed a new intelligent simulator in order to improve the learning effect. The new simulator will emphasize on:

2.1 Concept of filing is adjusted to general OS like MS-DOS and CP/M-86 so that learners can feel more familiar with.

2.2 There is an editor function to debug mistake in programs.

2.3 The simulator has I/O control which connects to actuator for helping the learner understand the interface functions.

2.4 The simulator also includes many supporting materials such as CAI, documentation, manual, HELP functions, to facilitate the beginners in coping with the assembly language.

2.5 Any exteral sensor or actuator can easily be connnected to Programable Peripheral Interface (PPI) via a connector.

2.6 The system was designed to draw out the learners ability to apply their knowledge with creativity.

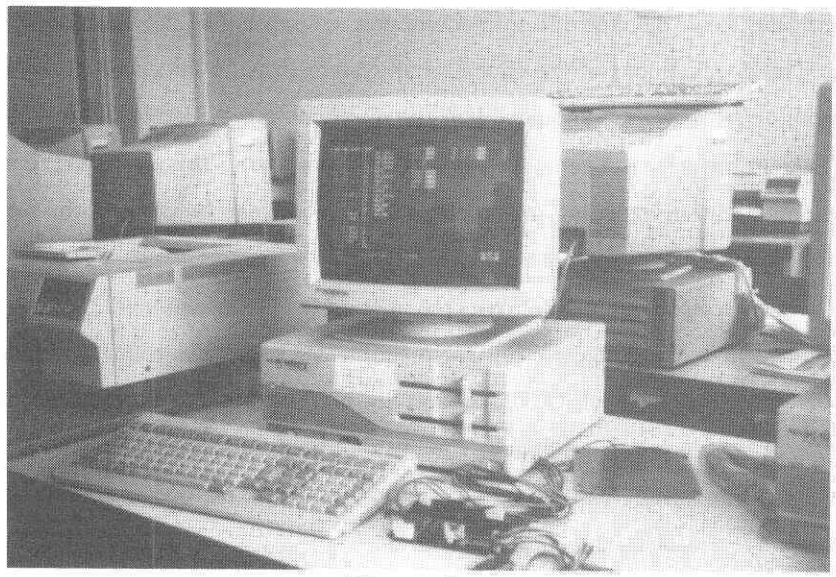

Figure 1

3．Hardware construction of intelligent simulator

The outline of the tested intelligent simulator is shown in Figure 2. It can be connnected to PC 9801 series Personal computer.

1. LED's　×8
2. switch interrupts　×8
3. thermistor　×1
4. photo transistor　×1
5. microphone　×1

Output section

1. relay circuits　×3
2. speaker circuit　×1

Shared section

1. PPI
2. A/D, D/A converter

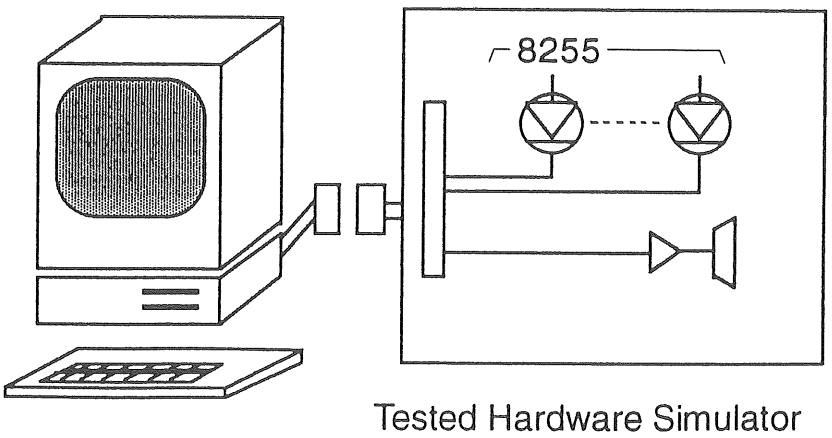

Figure 2
Hardware Construction

4．Software Outline of the Intelligent Simulator Speification

4.1　Host machinne : PC 9801 (personal computer)

4.2　CASL simulation language : BASIC

4.3　Total steps of CASL simulation : 900

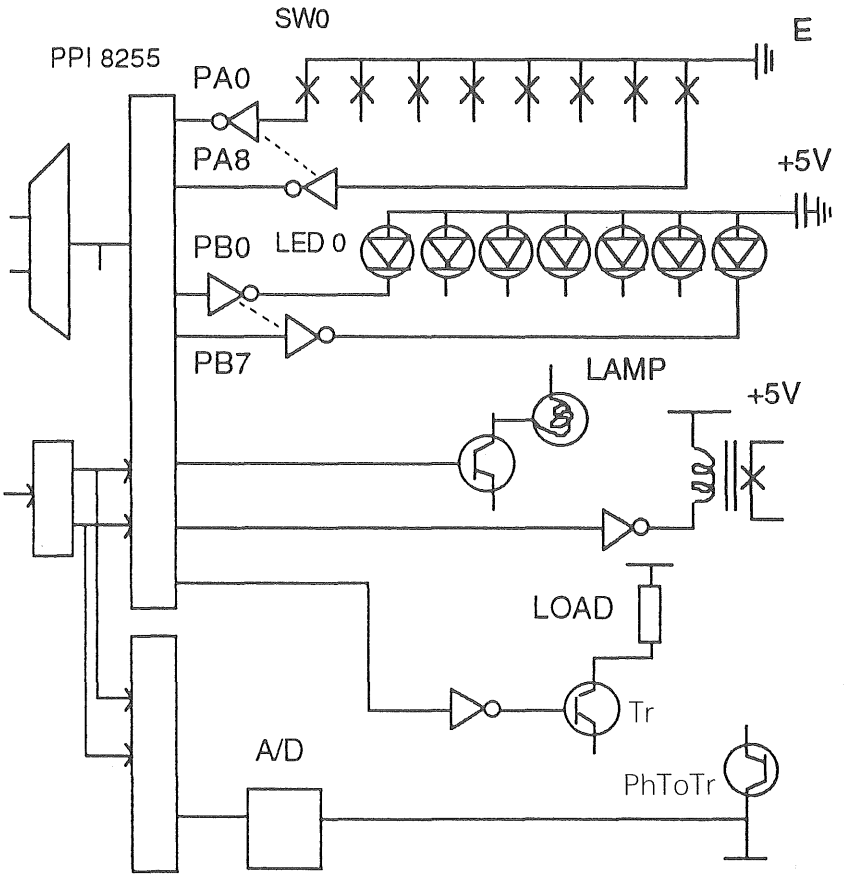

Figure 3
Tested Hardware Simulator Construction

4.4 CASL software funnction

4.4.1 File creating function

4.4.1.1 Source file creating and editing function

4.4.1.2 Assemblinng function (creating the object file)

4.4.2 Editor fuctionn

4.4.2.1 Trace function

4.4.2.2 Step (operating) function

4.4.2.3 Register display function. etc

4.4.3 HELP function

4.4.4 CAI function

4.4.5 I/O function

5. Outline of the intelligent simulator

5.1 Ugage

5.1.1 To create object files from source files via the file oreating function.

5.1.2 To edit programs via editor command when any bug is detected.

5.1.3 "GO" is the command to execute program.

5.1.3.1 Commands change to white by step operation in order to distinguish from unexecuted ones. Therefore, it is easier for learnners to understand.

5.1.3.2 I/O control training can be done via the tested hardware simulator.

5.1.4 It traces the object file image after the assembling or CASL execution. Example of this trace is shown in Figure 4 (at the end)

5.1.5 When CASL operation command is unknown, learners can ask for help by the HELP cmmannd.

2.1.6 When learners want to learn the basic of CASL, they will be able to systematically repeat it by CAI command which exeutes CASL courseware.

5.2 Practice Lists of the Intelligent Simulator Main practice Lists

5.2.1 LED display function program

5.2.2 A/D, D/A converter function program

5.2.3 Thermistor function program

5.2.4 Photo transistor function program

5.2.5 Speaker function program

6. Characteristics of the Test Intelligent Simulator

6.1 We have simulated the imaginary machine COMET・CASL to the concrete machine so that it can be easier for beginners.

6.2 It uses the same conncept of filing like those of genneral OS such as MS-DOS and CP/M-86

6.3 It has editor funnction and trace function which can help learners to know where they are, using color to indicate the being executed command can be good indicator.

4.6 HELP function was included.

6.5 The hardware simulator helps learners use I/O control command which enhance their understanding of I/O interface and programs.

6.6 Learners can prepare the Information-Technology Enginneers Examinnation by using intelligent simulator.

6.7 CAI function eases beginners to learn assembly language.

7. We would like to report the following topics in the future.

7.1 The effect of using simulator.

7.2 Improvement of the hardware and software.

7.3 Friendly environment of simulation

7.4 AI (Artificial Intelligence) development of the system

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*** COMET System,CASL ASSEMBLE LIST FOR NEC PC-9800 SERIES FILE : <HIKAKU>  ***

000             100 HIKAKU   START
002 1010 0020 110            LD      GR1,DATA1
004 1020 0021 120            LD      GR2,DATA2
006 1030 0022 130            LD      GR3,DATA3
008 4010 0021 140            CPA     GR1,DATA2
00A 6100 0014 150            JMI     NEXT1
00C 4010 0022 160            CPA     GR1,DATA3
00E 6100 001C 170            JMI     NEXT2
010 1110 0023 180            ST      GR1,MAX
012 6400 001E 190            JMP     OWARI
014 4020 0022 200 NEXT1      CPA     GR2,DATA3
016 6100 001C 210            JMI     NEXT2
018 1120 0023 220            ST      GR2,MAX
01A 6400 001E 230            JMP     OWARI
01C 1130 0023 240 NEXT2      ST      GR3,MAX
01E             250 OWARI    EXIT
                260 ;
020             270 DATA1    DS      1
021             280 DATA2    DS      1
022             290 DATA3    DS      1
023             300 MAX      DS      1
024             310          END
*** COMET System,CASL TRACK ON LIST FOR NEC PC-9800 SERIES FILE : <HIKAKU>  ***

HIKAKU START                 R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0002
       LD    GR1,DATA1       R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0004
       LD    GR2,DATA2       R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0006
       LD    GR3,DATA3       R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0008
       CPA   GR1,DATA2       R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=000A
       JMI   NEXT1           R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=000C
       CPA   GR1,DATA3       R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=000E
       JMI   NEXT2           R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0010
       ST    GR1,MAX         R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0012
       JMP   OWARI           R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=001E
OWARI  EXIT
PROGRAM STOP
```